

CLAIMS

What is claimed is:

- 1 1. An annular seal assembly for providing a fluid seal between an active
2 pressure differential device and a wellbore sidewall, the seal assembly
3 comprising:
4 a selectively inflatable seal element that is actuatable between a
5 first position wherein the seal element is uninflated and a second position
6 wherein the seal is inflated to provide a fluid seal; and
7 a hydraulic inflation system for selective actuation of the seal
8 element between its first and second positions.
- 1 2. The annular seal assembly of claim 1 wherein the hydraulic inflation
2 system comprises a fluid buffer to protect the inflatable element from excessive
3 inflation forces.
- 1 3. The annular seal assembly of claim 1 wherein the annular seal assembly
2 is actuated by flow of drilling mud.
- 1 4. The annular seal assembly of claim 1 wherein the hydraulic inflation
2 system comprises a hydraulic fluid chamber having an open end that is exposed
3 to drilling mud flow, the drilling mud flow providing a fluid pressure source for
4 inflation of the seal element to its inflated position.
- 1 5. The annular seal assembly of claim 2 wherein the fluid buffer comprises a
2 compressible spring for absorbing excessive fluid pressures.
- 1 6. The annular seal assembly of claim 1 wherein the seal element is at least
2 partially coated with a lubricant to facilitate movement of the seal element within
3 a wellbore.

1 7. The annular seal assembly of claim 1 wherein the seal element comprises
2 an elastomeric inflatable packer.

1 8. The annular seal assembly of claim 4 wherein the open end of the
2 hydraulic fluid chamber is located on a radial exterior of said active pressure
3 differential device to receive drilling mud that is returning to a surface of a well.

1 9. The annular seal assembly of claim 4 wherein the open end of the
2 hydraulic fluid chamber is located on a radial interior of said active pressure
3 differential device to receive drilling mud that is being pumped downward through
4 the active pressure differential device.

1 10. A system for providing an active pressure differential within a wellbore, the
2 system comprising:

3 an active pressure differential device having an outer housing and
4 a fluid pump component;

5 an annular seal assembly for providing a fluid seal between the
6 housing of the active pressure differential device and a wellbore sidewall,
7 the seal assembly comprising:

8 a selectively inflatable seal element that is actuatable between a
9 first position wherein the seal element is uninflated and a second position
10 wherein the seal is inflated to provide a fluid seal; and

11 a hydraulic inflation system for selective actuation of the seal
12 element between its first and second positions, the hydraulic inflation
13 system comprising a hydraulic fluid chamber having an open end that is
14 exposed to drilling mud flow, the drilling mud flow providing a fluid
15 pressure source for inflation of the seal element to its inflated position.

1 11. The system of claim 10 wherein the hydraulic inflation system further
2 comprises a buffer for absorbing excessive inflation pressures.

1 12. The system of claim 10 wherein the hydraulic inflation system further
2 comprises a pair of cylinders, each of the cylinders being in fluid communication
3 with the seal element and each of the cylinders contains a spring.

1 13. The system of claim 12 wherein the cylinders are in fluid communication
2 with each other

1 14. The system of claim 10 wherein the seal element comprises an annular
2 elastomeric packer element that is integrated into a housing of the active
3 pressure differential device.

1 15. The system of claim 10 wherein the active pressure differential device
2 comprises a pump.

1 16. A system for providing an active pressure differential within a wellbore, the
2 system comprising:

3 an active pressure differential device having an outer housing and
4 a fluid pump component;

5 an annular seal assembly for providing a fluid seal between the
6 housing of the active pressure differential device and a wellbore sidewall,
7 the seal assembly comprising:

8 a seal element that is set against the wellbore sidewall to
9 provide a fluid seal, and

10 a fluid passage that allows wellbore fluids to bypass the seal
11 element as the active pressure differential device and
12 annular seal assembly are run into the wellbore.

1 17. The system of claim 16 wherein the fluid passage comprises a trip valve
2 that permits one way fluid flow.

1 18. The system of claim 16 wherein the seal element comprises a radially
2 deformable mud cup.

1 19. The system of claim 16 wherein the seal element is set by rotation of a
2 sleeve element to preclude fluid flow through the fluid passage.

1 20. A method of providing a seal between an active pressure differential
2 device and a cased borehole wall, the method comprising the steps of:

3 disposing an active pressure differential device into a wellbore to a
4 desired depth, the active pressure differential device having a fluid pump
5 and a radially outer housing, the active pressure differential device further
6 having an annular seal element upon the outer housing;

7 setting the seal element to provide a fluid seal between the active
8 pressure differential device and the cased borehole wall.

1 21. The method of claim 20 wherein the seal element is inflated by flowing
2 drilling fluid into the active pressure differential device and returning it to the
3 surface of the wellbore.

1 22. The method of claim 20 further comprising the step of buffering the seal
2 element against excessive inflation pressures.

1 23. The method of claim 20 wherein the step of setting the seal element
2 further comprises receiving drilling fluid pressure into a hydraulic chamber within
3 the housing, said drilling fluid pressure then being used to inflate the seal
4 element.

1 24. The method of claim 20 wherein the step of setting the seal element
2 comprises setting a radially deformable seal against the cased borehole wall.

1 25. The method of claim 20 wherein the radially deformable seal is set against
2 the cased borehole by a pressure differential across the annular seal element.

1 26. The method of claim 20 wherein the step of setting the seal element
2 comprises radially expanding a seal portion under spring bias to engage the
3 cased borehole wall.

1 27. The method of claim 20 wherein the step of setting the seal element
2 further comprises axially moving a sliding sleeve to permit the seal portion to
3 expand radially into engagement with the cased borehole wall.

1 28. The method of claim 20 wherein the step of disposing the active pressure
2 differential device into the wellbore further comprises allowing wellbore fluids to
3 bypass the seal element as the active pressure differential device is disposed
4 into the wellbore.

1 29. The method of claim 28 wherein wellbore fluids are passed through a trip
2 valve to bypass the seal element.